SOLAR OBSERVATIONS

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SOLAR RADIATION OBSERVATIONS, MARCH 1940

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Measurements of solar radiant energy received at the surface of the earth are made at nine stations maintained by the Weather Bureau, and at ten cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data, obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian silver-disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, then departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct radiation intensities during March at Washington and Madison averaged close to normal. The data for Blue Hill will be published in the April Review; the Lincoln normal incidence data are of questionable validity because of instrumental trouble.

Total solar and sky radiation averaged considerably below normal at Lincoln, and somewhat below normal at Chicago, Fresno, La Jolla, and Riverside. Sizable excess departures were recorded at New York, New Orleans, Blue Hill, and Friday Harbor.

No polarization measurements were obtained at Madison, Wis., because of almost continual snow cover.

TABLE 1.—*Solar radiation intensities during March, 1940*

[Gram-calories per minute per square centimeter of normal surface]

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
WASHINGTON, D. C.											
March 8	3.45	0.80	0.87	0.90	1.01						3.63
March 11	1.88				.88						1.32
March 12	.81				1.39						1.19
March 25	1.07				1.19	1.55					.74
March 26	1.45			.92	1.04						1.45
Means		(0.80)	(0.87)	(0.91)	1.10	(1.55)					
Departures		+.07	+.06	−.04	−.05	+.12					
MADISON, WIS.											
March 7	1.88		.81	.98		1.43					2.87
March 11	1.32		.96	1.13	1.24	1.44					2.49
March 16	2.16	.92	1.04	1.15		1.44					3.30
March 19	2.87	1.04	1.14	1.26	1.42	1.55					4.37
March 20	1.96				1.42	1.61					2.87
March 22	.81	1.10	1.18	1.33	1.45	1.60					1.45
March 23	.91	.96	1.07	1.19	1.39	1.55					1.37
March 25	1.07	.90	1.02	1.16	1.37	1.58	1.21				1.32
March 30	4.75			.55	1.07						6.76
Means		.98	1.03	1.09	1.38	152	(1.21)				
Departures		+.09	+.02	−.06	+.07	−.04	−.08				

* Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Gram-calories per square centimeter													
	Washington	Madison	Lincoln	Chicago	New York	Fresno	Albuquerque	La Jolla	New Orleans	Riverside	Blue Hill	Newport	Friday Harbor	Cambridge
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Feb. 26	158	143	179	78	192	280	391	435	366	412	348	299	155	310
Mar. 4	350	354	197	216	272	445	516	444	372	456	257	291	204	247
Mar. 11	306	281	337	301	344	477	609	492	383	483	432	430	246	402
Mar. 18	426	480	316	264	435	474	603	306	353	327	407	420	400	389
Mar. 25	366	342	376	268	315	296	580	372	307	255	368	385	303	369
	Departures from weekly normals													
Feb. 26	−123	−127	−140	−120	−51	−102		+29	+105	+26	+37	+17	−8	
Mar. 4	+38	+51	−137	+1	+16	+45		+50	+46	+34	−41	−17	0	
Mar. 11	−12	−37	−32	+68	+80	+56		+92	+28	+58	+125	+78	+45	
Mar. 18	+82	+154	−76	+11	+123	+25		−102	−14	−42	+12	+20	+126	
Mar. 25	+20	−14	−5	+15	+34	−175		−98	−12	−125	−11	−8	−8	
	Accumulated departures on Mar. 31													
	+1,183	+616	−3,409	+273	+2,688	−1,890		−1,267	+1,512	−2,471	+1,659	+833	+1,764	